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ABSTRACT

A major theoretical issue in the study of language processing and language acquisition is whether language development is independent of other aspects of cognitive development, encapsulated in a "language module." This issue is discussed as it relates to lexical processing. The paper begins with a historical contextualization of the modular view of the mind and a general discussion of language processing from a modular perspective. It then considers and critiques some arguments in favor of modularity based on neurolinguistic data, before examining the cases for and against the notion that the formal aspects of lexical processing are "informationally encapsulated." Finally, it discusses the relevance of the modularity concept to lexical processing. (MSE)

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Lexical processing and the "language module"

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Lexical processing and the "language module"

by

David Singleton

1 Introductory

It is a commonplace that the major theoretical issue in the domain of language acquisition is the question of whether or not language development is independent of other aspects of cognitive development. The issue of the separateness or otherwise of the "language faculty" or "language module" also arises in respect of language processing, and in this co nnection different interpretations of certain lexical phenomena have figured prominently in the debate. This in itself seems a good reason to consider the arguments for and against modular processing in any treatment of the mental lexicon. However, it is not the only reason.

Neglected though it has been in some recent publications on the mental lexicon (e.g. Aitchison 1994; Schmitt and McCarthy 1997; Schreuder and Weltens 1993), the modularity debate goes to the very heart of the large questions that researchers working on lexical issues face constantly, whatever their particular interests – questions about the distinguishability of "linguistic knowledge" from "pragmatic" or "encyclopedic" knowledge and about how and where to situate different aspects of lexical knowledge in relation to any putative linguistic "core". Obviously, these questions are every bit as relevant to second language lexical research as to first language lexical research. In the case of the former there is the added complication that some theoreticians have wished to make a qualitative distinction between knowledge of second language acquired beyond the childhood years and/or in a formal instructional setting and linguistic competence proper stored in the language module.

This paper begins with a historical contextualization of the modular view of the mind and a general discussion of language processing

from a modular perspective. It then considers and critiques some arguments in favour of modularity based on neurolinguistic data, before examining the case for and against the notion that the formal aspects of lexical processing are "informationally encapsulated". Finally, it discusses the relevance of the modularity concept to lexical processing.

2 The modular perspective on mind in its historical context

The tradition into which recent approaches to modular processing fit – and which modularists claim as their pedigree – is that of "faculty psychology". Faculty psychology is based on "the splintering of cerebral processes into a number of distinct faculties" (Evans 1978, pp.127f.). Its origins are customarily traced back to the work of Franz Josef Gall (1758–1828), a German anatomist who, while working as a physician in Vienna in the 1780s, developed the view that intellectual and behavioural attributes were each controlled by a particular location in the brain. He opposed this "vertical" account of the nature of mind, in which the character of mentation was seen as dependent on the subject matter involved, to the "horizontal" account of the mind – widely accepted since Classical Antiquity (see, e.g., Laihiala-Kankainen 1996) –, which represented mental operations as transcending content domains.

Gall recognized thirty-seven faculties – including, for example, destructiveness, self-esteem and conscientiousness. Moreover, he went further than simply assigning each of these faculties to a definite cerebral area; he also postulated that the faculty structure of the brain was reflected in the contours of the skull, each faculty corresponding to a different "bump". He was thus involved, together with his compatriot Johann Gaspar Spurzheim, in the foundation of the science – now almost universally dismissed as a pseudo-science (although it still, apparently, has its practitioners) – of phrenology, or the analysis of mind and character by reference to the topography of the skull.

The phrenological dimension has fallen away from "respectable" modern descendants of faculty psychology, and the faculties or modules identified by present-day modularists tend to diverge somewhat from Gall's original taxonomy. However, Gall's basic idea has been retained. The current version of the modularity hypothesis is very

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clearly summarized by Garfield in the editorial introduction to a well-known collection of essays (Garfield 1987a) on modularity:

> The mind is not a seamless, unitary whole whose functions merge continuously into one another; rather, it comprises – perhaps in addition to some relatively seamless, general-purpose structures – a number of distinct, specialized, structurally idiosyncratic modules that communicate with other cognitive structures in only very limited ways. (Garfield 1987b, p.1)

The kinds of systems that are hypothesized to be modular within this perspective include input systems such as certain components of the perceptual and the language-reception systems, and output systems such as aspects of motor control and language production. According to the modularity hypothesis the nature of the functioning of these systems is qualitatively different and to a large degree isolated from the presumably nonmodular operations of, for example, long-term memory and general knowledge processing.

3 Modularity and language processing: the thoughts of Chomsky and Fodor

The two most distinguished and influential proponents of the modular model of cognition as it relates to language are Noam Chomsky and Jerry Fodor. For Chomsky the question of the separateness of the language faculty is bound up with the question of language acquisition. From a very early stage his "poverty of stimulus" argument (see, e.g., Chomsky 1965, p.58), which caused him to reject the idea that language development was possible on the basis of "general learning mechanisms" (see, e.g., Chomsky 1979a, 1979b) and to propose instead the idea of the language faculty as a "mental organ" with its own programme of "growth" (see, e.g., Chomsky 1980a, p.245), ineluctably disposed him to draw the conclusion that "the mind is *modular* ... consisting of separate systems with their own properties" (Chomsky 1988, p.161):

> Insofar as there is little in the way of innate structure, what develops in the mind ... will be a homogeneous system derived by the application ... of common principles .... Correspondingly, the belief that various systems of mind are organized along quite different principles leads to the natural conclusion that these systems

are intrinsically determined. (Chomsky 1980b: for further discussion see, e.g., Cook and Newson 1996, pp.30ff.; Rosenthal 1980; Botha 1989, pp.113ff.).

A somewhat different approach to the modularity question is taken by Fodor. It is not that Fodor has problems with Chomsky's claim that language acquisition is governed by an innate language faculty. On the contrary, if one looks, for example, at the proceedings of the celebrated debate between Piaget and Chomsky at Royaumont (Piattelli-Palmarini 1979), where the central issue was precisely that of the *"noyau fixe inné"*[1], one finds that Fodor's role during the debate was essentially that of Chomsky's second. Moreover, as we shall see, acquisitional arguments form an important part of the case Fodor makes for his own conception of the language module. However, from an early stage Fodor has been inclined to introduce into the argument a methodological dimension that is not so readily discernible in Chomsky's work. Basically, Fodor suggests (De Zengotita, Chomsky, Bateson, Premack, Papert and Fodor 1979, p.392) that the only real hope of making progress in the study of mind is to focus on small autonomous cognitive domains. This methodological concern recurs in some of Fodor's later publications, in which he calls into question the amenability to investigation of nonmodular operations, and expresses deep pessimism about the prospects for cognitive science unless such autonomous modules are actually found to exist in the mind:

> It may be that, from the point of view of practicable research strategy, it is only the modular cognitive systems that we have any serious hope of understanding. In which case, convincing arguments for nonmodularity should be received with considerable gloom. (Fodor 1983, p.38)

One might note that it is also possible to be pessimistic about prospects for psychology and cognitive science were the modularity hypothesis to prove to be correct:

> If the modularists are on the right track, there is a disturbing possibility for psychology. Rather than being a single coherent discipline – as its leading figures have understandably wished – psychology may turn out to be more of a holding company. In such a vision, there will be separate studies of language, music, visual

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processing, and the like, without any pretense that they fit into one supradiscipline. (... this may be a possible fate for cognitive science as a whole.) (Gardner 1987, p.133)

A more fundamental difference between Chomsky and Fodor in this connection, however, than the absence or presence of methodological preoccupations is that, whereas Chomsky focuses on the nature of the information that the language faculty innately contains, its "innately specified propositional contents" (Fodor 1983, p.7), Fodor's interest goes beyond the propositional to the processual. The central theme of his work is indeed the question of the extent to which actual psychological mechanisms are modular – a question which for Chomsky falls into the area of performance and outside what he considers his domain as a linguist. Fodor shows just a little impatience with Chomsky's point of view:

> ... you need ... mechanisms that function to bring the organization of behavior into conformity with the propositional structures that are cognized. This is the problem of "performance". ... Performance mechanisms do for Chomsky some of what the pineal gland was supposed to do for Descartes .... (Fodor 1983, p.9)

This question of precisely what is to be understood as covered by the notion of language faculty or module is a large one. Quite apart from the propositional/processual issue just mentioned, there is also the problem of which aspects of language might be included in the language module – in terms of what used to be called linguistic "levels" (phonology, morphology, syntax, semantics, etc.). Chomsky is cautious in his pronouncements on the scope of the language module. He assumes that its central component is "grammatical competence", but does not come to any very firm conclusions about the precise boundaries of such competence. He questions, for example, whether the organization of sound belongs properly to the system of language rather than to other systems (1980, p.61), and he has long evinced agnosticism about the organization of meaning:

> It is not clear at all that it is possible to distinguish sharply between the contribution of grammar to the determination of meaning, and the contribution of so-called "pragmatic considerations", questions of fact and belief and context of utterance. (Chomsky 1972, p.111)

> Do the "semantic rules" of natural language that are alleged to give the meanings of words belong to the language faculty strictly speaking, or should they be regarded perhaps as centrally-embedded parts of a conceptual or belief system, or do they subdivide in some way? (Chomsky 1980a, p.62)

Fodor, for his part, seems to entertain no doubts about the intramodularity of phonetic/phonological processing. With regard to semantic processing he takes, as we shall see, a not dissimilar line to Chomsky's, although this does not prevent him from seeing the "shallower" aspects of lexical processing as intramodular (see, e.g., Fodor 1983, pp.64ff.; 1987a, pp.55ff.; 1989, pp.5ff.; Carston 1988, pp.51ff.). Other modularists, such as Smith (see, e.g., Smith and Wilson 1979) and Fromkin (see, e.g., Emmorey and Fromkin 1988) have insisted that "linguistic" meaning is clearly separable from other varieties of meaning and are content to regard the former as being represented and processed within the language module.

Fodor fully concurs with Chomsky in acknowledging severe limits on the degree of modularity that it is plausible to postulate. Neither wishes to claim that the encapsulation of the language module – whatever it contains – is absolute, or that every aspect of cognition is modularly organized. Fodor resists this notion with some vehemence, dismissing it as "modularity theory gone mad" (Fodor 1987b, p.27). It is obvious that the normal use of language demands an interface between language and other aspects of cognition, and Fodor and Chomsky both hold that this interface is provided by some kind of "central", that is, general, nonmodular, system which interconnects the modules and enriches their output with a range of experience accumulated from the previous operation of the various modules. As was made clear in the last section, the modularist position posits only, in relation to language, that there is a dimension of language-related cognition which is subserved solely by the language module, and that what happens within this dimension is impervious to "central" knowledge and processes. On this view, the contribution of "central" elements is a separate stage or level of language-related cognition from the strictly linguistic responsibilities of the language module.

4 An empirical pause for thought: the evidence from neurolinguistics

As a qualification both to the foregoing and to what follows, it is worth observing that both Chomsky (e.g., 1981, p.33) and Fodor (e.g., 1989, p.11) admit to some reservations about the general empirical foundations of the modularity hypothesis. Whatever their theoretical predispositions, both are obliged by the current state of the evidence to regard the question of whether or not language is subserved by a separate faculty as an empirical one.

A very useful contribution to the debate in this connection from the modularist viewpoint would have been some neurolinguistic indications of a specific physiological correlate of an autonomous language module. However, such indications as are forthcoming in this area are not generally seen as offering unambiguous support for the modularity hypothesis (see, e.g., Jacobs and Schumann 1992), although some writers on the subject have been prepared to interpret neurological data in a straightforwardly modularist manner (e.g., Gazzaniga 1992, pp.124f.; Pinker 1994, pp.45ff.). A particularly ambitious and influential example of this latter kind of approach is an article by Linebarger (1989) in which she reviews in some detail evidence from studies of Wernicke's aphasia, dementia, transcortical sensory aphasia and Broca's aphasia. In view of the importance and the wide-ranging nature of the article in question it is worth subjecting it to close scrutiny in the present context. Also worthy of note in this connection is a recent series of articles by Ellis (e.g., 1994a, 1994b, 1994c, 1995) in which, while not necessarily endorsing a Chomskyan or a Fodorian conception of modularity, he nevertheless makes strong claims based on neurological data about a disjunction between formal processing and semantic processing.

Let it be said that Linebarger begins by admitting the "limitations of neuropsychological data" (Linebarger 1989, p.198). She cites Caramazza's (1984) caveats concerning the assumptions which underlie psycholinguistic interpretations of neurological findings – the assumption that brain damage does sometimes "fractionate the cognitive system on along cognitively significant lines" (Caramazza 1984, p.10) and the assumption that there is a transparent relationship in structural terms between the reduced processing of brain-injured subjects and normal processing. Clearly, both these assumptions are open to dispute. She also concedes that neurological data are "noisy":

> There is considerable fluctuation within patients and still more within the broad categories of aphasic impairment demarcated by the classical typology of aphasic syndromes. The linguistic performance of even a single aphasic patient is unlikely to be captured by postulating a pathological but consistent idiolect .... (Linebarger 1989, p.199)

Obviously, "noise" of this kind would tend to undermine confidence in the reliability of any hard and fast boundaries in respect of different aspects of processing.

Most of the data actually presented by Linebarger reinforce this last point. Thus, Wernicke's aphasia, which is supposed to be characterized by syntactic well-formedness and lexical anomalousness, is illustrated by an example (from Goodglass and Kaplan 1972, p.59) which shows that in fact the lexical disruption is accompanied by serious syntactic problems (deployment of inappropriate grammatical categories, omission of required grammatical categories, misconceived argument structure, etc.):

> He wife saw the wonting to wofin to a house with the umbledor. Then he left the wonding then he too to the womin and to the umbrella upstairs.

Similarly, in relation to dementia, in which, according to Linebarger's definition, "diffuse cerebral pathology impairs cognitive processing generally, with severe impairment to comprehension of word meaning" (Linebarger 1989, p.203), the examples cited fail to demonstrate a neat syntax-semantics divide. Linebarger draws on a case study by Schwartz, Marin and Saffran (1979). The patient in this study had a very limited repertoire of nouns; when presented with sentences containing nouns that were no longer in her repertoire she could assign thematic roles on the basis of her knowledge of syntactic structure and the lexical properties of verbs, adjectives, prepositions, etc. but failed to demonstrate understanding of the precise sense of the sentences. On this evidence any postulation of a neat dissociation between lexico-semantic and syntactic processing looks highly dubious, since the only lexical category, apparently, that failed to be fully processed was that of nouns. Moreover, where the nouns used in the test sentences were in the patient's repertoire (as in *The man chases the woman*), she processed both the syntax and the semantics without difficulty.

Transcortical sensory aphasia resembles Wernicke's aphasia, with the difference that sufferers of this syndrome retain the capacity for repetition. Linebarger cites studies by Whitaker (1976) and Davis, Foldi, Gardner and Zurif (1978) which report such subjects engaged in the repetition of variously flawed sentences spontaneously correcting pronoun case and number agreement but not factual errors or semantic anomaly. Linebarger claims that this shows a dissociation between form and content and points towards an autonomous distinct system for processing linguistic form. However, from other studies of transcortical sensory aphasics it emerges that they do not necessarily experience word-*finding* difficulties (anomia) when *producing their own utterances*:

> ... patients with transcortical sensory aphasia have disturbances of auditory word comprehension due to a lesion affecting the pathway connecting the concept center and Wernicke's area, but need not have either anomia [severe word-finding problems] or a disturbance of the sound pattern of words in speech production. (Caplan 1988, p.243)

Once again, then, the idea of neat and consistent form–content dissociation fails to receive very persuasive support.

Finally, Linebarger discusses Broca's aphasia, otherwise known as agrammatic aphasia, which is classically described as a syndrome in which syntactic impairment is combined with the preservation of the capacity to use content words appropriately. She retails the following example of "agrammatic" speech, a Broca's aphasic's attempt to describe a picture of a girl beside a boy attempting to steal cookies behind the back of a woman washing dishes:

> A mother ... a dish ... drying. [What?] Plate ... a faucet ... running ... a boy, eating cookies ... eating the cookies ... girl.

It will be clear from this example that to characterize Broca's aphasia as "agrammatic" is in fact a wild exaggeration. There is plenty of "grammar" in the above set of utterances: a high proportion of the the word order is unexceptionable (*a faucet running, a boy eating cookies*), there is appropriate use of inflectional morphology (*-ing*), and in most instances where an article is required one is supplied (*a mother, a dish, a faucet, a boy, the cookies*). It is true that in very severe instances of Broca's aphasia production is limited virtually to strings of con-

tent words, but even in these instances some morphology tends to survive – notably *-ing*, "a staple of agrammatic speech" (Linebarger 1989, p.208) –, and, in any case, radical reduction of this type generates its own problems of interpretation:

> In such cases, it is difficult to determine if the patient is agrammatic since there is insufficient language production to judge whether grammatical formatives and syntactic structures are compromised. (Blumstein 1988, p.213)

With regard to comprehension, Linebarger states that a number of studies show Broca's aphasics performing poorly on sentence–picture matching tasks where crucial cues to meaning are grammatical (morphology, word order etc.) and performing better on such tasks where plausible scenarios can be built up on the basis of lexical content alone. Even in this narrow area of "asyntactic comprehension", however, the picture is confused. Thus, Linebarger cites (1989, pp.211ff.) data from her own research indicating that Broca's aphasics substantially retain the ability to make grammaticality judgments, which suggests the preservation of some measure of syntactic representation.

Ellis's (1994a, 1994b, 1994c, 1995) claim that there is a complete dissociation between the semantic and the formal aspects of the mental lexicon is based on acquisitional arguments; semantic aspects of words, according to him, necessarily engage conscious, explicit learning processes, whereas the formal aspects of a word are dealt with by implicit and unconscious processes. He cites in this connection evidence from studies of vocabulary and intelligence and studies of global amnesia (a condition resulting from damage to the hippocampus and limbic system in the middle brain). In relation to intelligence he notes that "children with non-verbal IQs as low as 30 ... can still complete the single word stage of language" (Ellis 1994a, p.41), but that the speech of severely mentally retarded children "lacks content" (ibid., p.42) and that vocabulary size (which he links to "the mapping between lexical, semantic and conceptual domains"; ibid.) strongly correlates with academic intelligence. As far as the evidence from global amnesics is concerned, this strongly suggests a complete dissociation between implicit and explicit learning: amnesics "show normal implicit learning yet ... lose the ability to consciously recollect any events that occur after their brain damage" (Ellis 1995, p.108).

With specific regard to amnesics' vocabulary learning:

> They show normal *implicit learning* of the perceptual aspects of novel word forms. ... They show normal *implicit learning* of new motor habits and the motor aspects of novel word forms that are necessary for language production. ... Yet amnesics are unable to learn the meaning of new words. They are severely deficient at developing new conceptual information and at making new semantic links. *Explicit learning* is involved in acquiring and processing word meanings. (ibid., pp.108f.)

One has to tread carefully with the above evidence. In relation to IQ and language learning, for example, the fact that mentally retarded children may produce semantically anomalous utterances by no means implies that their speech is asemantic – "lacks content" (see above). As for the evidence from amnesics, this does seem to show that learning the forms and learning the meanings of novel words require to be *initiated* by the operation of different items of neurological "hardware"; what it does not show is that all aspects of the learning of form and meaning respectively are at all stages of a word's integration into the mental lexicon separately managed or that, if all systems are up and running, the different mechanisms do not "talk to each other".

All in all, neurological data do not provide anything like clearcut support for the modularity hypothsesis. The fact that different aspects of cognition may be affected to different degrees by different kinds of lesions to the brain is certainly compatible with the notion that there are different kinds of knowledge represented in the brain and that their neurological correlates may be differentially distributed, but this is a far cry from the positing of qualitatively distinct, operationally self-contained modules. Moreover, much current thinking among neurolinguists is moving away from the idea that linguistic and other subsystems are directly instantiated in localized areas in the brain and that brain damage disrupts the essential structure of such subsystems. Rather, the present reading of available research seems to be that in aphasia "the processing operations affecting access to and communication between these components are impaired" (Blumstein 1988, p.230). If this reading of the evidence is the correct one, it throws serious doubt on the possibility of arriving at any simple interpretation of such evidence in relation to the modularity de-

bate, which revolves precisely around the question of communication with and access to the postulated language module in normal language processing.

5 Language processing in a Fodorian perspective

Despite such empirical uncertainties, and others that we shall examine later, the modular perspective on language and mind remains a powerful paradigm in linguistics and psycholinguistics. As we have seen, the processing aspect of modularity has been the main focus of Fodor's writings on the topic. It is also true to say that Fodor's version of the modularity hypothesis has been more influential than any other among psycholinguists working on processing issues. Accordingly, it is appropriate in the present context to pay particular attention to what Fodor has to say on the question of modularity in relation to language processing.

As will have become obvious from earlier discussion, a crucial aspect of the whole modular conception of mind is the notion of "domain specificity". In relation to language, the domain specificity claim affirms that the particularities of language are such that they must be dealt with by a distinct psychological faculty. According to Fodor, direct processing evidence in support of this position is provided by the Haskins Laboratories experiments (Liberman, Cooper, Shankweiler and Studdert-Kennedy 1967), which showed that an identical signal was perceived differently when encountered as speech from the way in which it was analysed when encountered in a nonspeech context.

> ... the very same signal that is heard as the onset of a consonant when the speech specifies that the stimulus is speech is heard as a "whistle" or "glide" when it is isolated from the speech stream. (Fodor 1983, p.49)

A particularly oft-rehearsed part of this argument is that which starts from the premise that the class of nomologically possible human languages constitutes quite a small subset of the logically possible linguistic systems and that the former include only languages which conform to research-derived generalizations about the nature of human languages known as linguistic universals. The entire Chomskyan edifice in relation to the role of innate pre-information

in language acquisition is founded on the concept of universals (for further discussion see, e.g., Cook and Newson 1996, pp.75ff.). In a processing perspective, Fodor deploys the universals argument thus:

> ... the more elaborate and complex the theory of univerals comes to be, the more eccentric the stimulus domain for sentence recognition. And ... the more eccentric a stimulus domain, the more plausible the speculation that it is computed by a special purpose mechanism. (Fodor 1983, p.51)

Another of Fodor's claims is that the processing of utterances in a known language is "mandatory" – i.e., that one cannot but hear such utterances as sentences. He cites in this connection Marslen-Wilson and Tyler's comment on the fact that even when subjects are asked to focus on the acoustic-phonetic properties of the input, they do not appear to be able to avoid identifying the words involved.

> This implies that the kind of processing operations observable in spoken word recognition are mediated by automatic processes which are obligatorily applied. (Marslen-Wilson and Tyler 1981, p.327)

For Fodor this makes language processing akin to reflexes in the sense that both "are automatically triggered by the stimuli that they apply to" (Fodor 1983, p.55).

A further feature of Fodor's discussion of modularity is his claim that most linguistic processes lie in the realm of the unconscious and are relatively inaccessible to consciousness. This kind of proposal is familiar in the L2 acquisition research area from the work of Krashen (e.g., 1981), who deployed it in the elaboration of his own particular version of the modularity hypothesis – with its self-contained "learning" and "acquisition" components. Fodor cites, among other evidence, Liberman et al.'s (1967) finding that, although subjects react differently to acoustic distinctions which do not differentiate phones, they fail to report on such distinctions in judgment tasks. Fodor's interpretation of this finding is that the architecture of the mind is such that the "central" systems are not called on to deal with representations which have not been "corrected" by analysis within the relevant specialized module, "interlevels of perceptual processing being correspondingly opaque to higher cognitive systems" (Fodor 1983, p.60).

Fodor is keen to emphasize also the speed of language processing

as opposed to, for example, problem-solving activities like chess. He refers to Marslen-Wilson's well-known speech-shadowing[2] experiments (1973) and the finding they yielded that, at least for some subjects, a lag of 250 milliseconds between stimulus and response is all that is required not only for a faithful repetition of the stimulus but also for comprehension and integration of the verbalization. Fodor relates such findings to his claim concerning the mandatoriness of the relevant processes; his suggestion is that because these processes are automatic computation time is saved that would otherwise have to be expended on determining whether and how they were to be performed. He once again draws an analogy with reflexes such as eye-blinking.

The other side of the coin as far as Fodor's claim regarding the isolation of central systems from "interlevels" of processing within the language module is concerned is his suggestion that such processing is "informationally encapsulated". By this he means that general information which is specified only at relatively high levels is not fed into the mechanisms of the language module. In other words, Fodor's view is that language processing mechanisms are, as it were, blinkered with regard to data other than the specifically linguistic data on which they are designed to operate. It is worth saying that Fodor regards encapsulation as the very cornerstone of the entire modular edifice that he wishes to construct. It is certainly the most controversial feature of the model, since, as Fodor freely acknowledges, it appears to fly in the face of a very great deal of recent work in psycholinguistics. Moreover, it seems not to accord with ordinary experience of language use and also to be undermined by phenomena attested in what one might call extraordinary language use. We shall return to a consideration of the relevant evidence in this connection a little later.

Three further characteristics are ascribed by Fodor to the language module: "neural hardwiring", particular breakdown patterns, and specific developmental features. In relation to the first, he says that the key to modularity is informational encapsulation and that this implies a kind of neural architecture which privileges the intramodular paths of informational access. In any case, he claims, "we do find neurological structure associated ... with language" (1983, p.99). Concerning breakdown patterns, he points to the "general agreement that the agnosias and the aphasias constitute patterned failures of functioning" which cannot be explained in terms of "decrements in glo-

bal, horizontal capacities like memory, attention or problem-solving" (ibid.). Finally, on the question of ontogeny, he refers to the "considerable body of findings about the ontogenetic sequencing of language acquisition", which he interprets as compatible with the view that a great deal of the developmental course of language is "endogenously determined" (ibid., p.100).

In summary, then, Fodor sees the operations of the language module as domain-specific, mandatory, relatively impervious to central access, fast, informationally encapsulated, "shallow", neurally "hard-wired", and exhibiting characteristic breakdown patterns and ontogeny. In point of fact, Fodor restricts his discussion to language perception and the "input system" aspects of language processing, although some of the evidence he cites also has a productive dimension. Thus the question of the relationship between the language module's input function and its output function is not specifically addressed by Fodor, so that, as Carston (1988, p.47) notes, one of the issues raised by Fodor's proposals is whether a single module is evisaged, with input and output functions, or two modules – one for each function. Another unresolved question is whether certain learned activities, such as literacy skills, are to be regarded as modular. Carston (ibid.) suggests that reading, for example, shares many features with the processing of spoken language but points out that that reading is obviously not innately specified. A third question – of the many to which Fodor's work gives rise – is that of the nature of the interface between intramodular and extramodular processing – "what are the outputs of the modules like and how is the interface with the central systems effected?" (ibid.).

6 Informational encapsulation: keystone and battleground

As has already been indicated, the most problematic aspect of the Fodorian conception of modularity is the notion that modules are "informationally encapsulated" – the notion that, with regard to language processing, for example, general knowledge, contextual information, etc. have no role in intramodular linguistic "computations". In defending this view Fodor refers not only to psycholinguistic evidence which he interprets as favourable to it, but also to what he calls the "teleological argument". He claims that modules such as the language module are informationally encapsulated because they

need to be in order to operate as speedily and as efficiently as they do. One of the examples from visual perception he uses (1989, p.11) is the case of someone spotting a "yellow stripey thing" in New York and having to come to a rapid conclusion about whether it is a tiger. He argues that in such circumstances a perceptual system that was permeable to contextual expectations would not function rapidly enough to avoid disaster:

> ... since perception is clearly specialized for the fixation of belief about local distal objects, and since it's the local distal objects that one eats and gets eaten by, it is biological good sense for perceptual systems to be fast. ... if you want speed, make perception as much like a reflex as possible. That is, make it as encapsulated as you can. (Fodor 1989, p.11)

Against Fodor's line of reasoning one can note that one quite frequently comes across reports of people not believing and therefore not responding appropriately to the evidence of their senses. Specifically in relation to language one can point to what commonly happens in situations where, for one reason or another, the expectation is that language x is being spoken but where, in fact, it turns out that language y is being used. In such circumstances, comprehension is typically blocked, even where both languages are familiar to the individual in question. For example, the psychologist Elisabet Service, whose L1 is Finnish, has retailed the following experiences to me:

> My sister, while studying in France was once addressed on the street in Finnish. Only after several attempts by the speaker did she understand her own native language, the point being that she was expecting French. I have had a very similar experience trying to make Finnish out of something that was easy enough to understand when I realized it was English. (Service, personal communication)

Indeed, it is by no means unknown for people to be led by situational expectations actually to respond to utterances addressed to them in one language as if the utterances had been produced in another language. The following account of an experience of the Allied agent Hans Nütt behind German lines in World War II is a case in point. Nütt was apparently terrified of parachute jumps and on one occasion attempted to steady his nerves by consuming a large

quantity of Scotch en route to his jump site. The result was that he passed out on landing and did not wake until the next morning. Having buried his parachute, he set off in a state of deep confusion and struggling with a hangover.

> As he lurched along he met a Geman gendarme and, forgetting himself, greeted him with "Good morning!" in English. "Guten Morgen, mein Herr," the policemen replied, never even recognizing the mistake our agent had made. (Harris and Taylor 1985, p.291)

It is difficult not to infer from such experiences and from those of the kind referred to in the previous paragraph that higher level contextual factors are impacting in an "online" fashion on language processing.

Another body of evidence which seems to run strongly counter to Fodor's point of view is that which emerges from the observation of the effects of deep hypnosis. With appropriate suggestion, a hypnotized subject may perceive and interact with objects and persons which are not present – or even totally fictitious – and may fail to perceive objects and persons which are present.

> In response, for example, to the suggestion that an absent person is present, the subject may report that he sees, hears, and feels the hallucinated person and even carry on a conversation with the hallucinated image. (Orne and Hammer 1974, p.136)

Phenomena of this kind surely indicate that all perceptual systems, including that or those which operate in language perception, are radically penetrable by higher-level information.

Even reflexive responses may, apparently, be prevented or induced by hypnosis. Chertok, for instance, reports (1989, pp.63f.) some cases where hypnosis sufficed to anaesthetize patients undergoing surgical operations, and even to arrest salivation and bleeding. In another case, hypnotic suggestion occasioned a burn reaction in the absence of any heat: a hypnotic subject had a cold coin placed on her arm for two minutes, while it was suggested to her that the coin was burning her and would cause her arm to blister; shortly after being woken from the trance the subject complained of a burning sensation.

> On constate alors, à l'endroit où la pièce avait été posée, l'existence d'un érythème phlycténoïde évoquant une brûlure du premier degré.[3] (ibid., p.64)

If it is true – as it seems to be in the light of the foregoing – that something as fast and as automatic as a physiological reflex can be influenced by externally implanted information or pseudo-information, then the credibility of the notion of informational encapsulation in various dimensions of cognitive processing becomes decidedly shaky.

In any case, as Fodor recognizes, such a notion appears to conflict with a large number of psycholinguistic findings, notably the findings of experiments involving reduced-redundancy procedures like cloze.[4] It is a well-established fact that in cloze tasks the more predictable the target items in relation to the blanks (the higher their "cloze value"), the better the performance of subjects attempting to fill the blanks will be. This looks like strong evidence of "cognitive penetration" – evidence of the mechanisms involved in such tasks having access to subjects' expectations about the continuation of the texts in question.

To attempt to deal with evidence of this kind Fodor (1983) deploys two lines of argument. His first mode of response is to question whether the psychological mechanisms involved in the "highly attentional" process of reconstructing degraded linguistic stimuli are the same as those which mediate "automatic and fluent" processes. He cites in this connection an experiment conducted by Fischler and Bloom (1980) in which they found the recognition of test items where no degradation of the stimuli was involved to be only marginally affected by cloze value – and not at all affected by cloze value at high rates of presentation.

Fodor's second line of attack is to suggest that mechanisms internal to the language module may "mimic" effects of "cognitive penetration". In support of this suggestion he refers to an experiment of Swinney's (1979) in which subjects listened to stimulus sentences along the lines of "Because he was afraid of electronic surveillance, the spy carefully searched the room for bugs" – each containing an ambiguous word like *bug* – and at the same time made lexical decisions about letter strings presented visually immediately after the occurrence of the ambiguous items (i.e., decided whether the strings in question constituted words or nonwords). Swinney found a facilitation effect in relation to lexical decisions on strings forming words with meanings related to the meanings of the ambiguous words determined by their sentential contexts. Thus, the presentation of *bug* in the above sentence would facilitate a decision as to whether or not

microphone was a word. However, what Swinney also found was that decisions on strings with meanings related to meanings of the ambiguous items which were not suggested contextually were also facilitated. Thus, the presentation of *bug* in the above context would also facilitate a decision on *insect*. To Fodor this finding indicates that what looks like general contextual effects in language processing may in fact may be a matter of interlexemic excitation. He hypothesizes that the the mental lexicon is a sort of connected graph, with lexical items at the nodes and with paths from each item to several others, and that accessing an item in the lexicon consists in exciting the corresponding node, which also occasions the excitation of pathways that lead from that node:

> ... when excitation spreads through a portion of the lexical network, response thresholds for the excited nodes are correspondingly lowered. Accessing a given lexical item will thus decrease the response times for items to which it is connected. (Fodor 1983, p.80)

These particular arguments will be re-examined in the next section. It is worth mentioning immediately, however, that Fodor's conception of intramodular excitation of connected lexical forms relates to what he has to say about the relative shallowness of intramodular language processing. For Fodor inclines to the view that intramodular processing in general is an essentially formal matter. Citing evidence from his own work (Fodor et al. 1980) that the recovery of the semantic definition of lexical items is not a prerequisite for processing syntax, he posits that the language module "provides no semantic analysis 'inside' lexical items" (Fodor 1983, p.92), and that the language module's operations are confined to the processing of "linguistic and maybe ... logical form" (ibid., p.90). This brings us directly to the question of the mental lexicon in relation to the modularity hypothesis.

7 Modularity and the lexicon

The mental lexicon is, in fact, a particularly important discussion-point in the context of a consideration of the modular view of language in the mind, since it is at the level of lexis that language and "everything else" intersect. On a common-sense view at least, lexical knowledge and processing involve not only phenomena which are

peculiarly linguistic in character – morphemic structure, syntactic categories, etc. – but also phenomena which play a role in domains of cognition and activity well beyond the purely linguistic – notably a very broad range of perceptions and beliefs derived from past experience and current context.

A very widely held view among linguists of the interface between the linguistic and the extralinguistic in language processing is that there is substantive meaning-related knowledge on, as it were, both sides of the join. The following quotation is a fairly typical statement of this position:

> A principled distinction between lexical or linguistic semantic knowledge and other cognitive knowledge ... must still be elaborated. That such a distinction exists seems to be unquestionable, as can be seen by the simple example of the difference between knowing the meaning of the word "water" and knowing that its chemical structure is H_2O. Obviously one can know the first without knowing the second. A modular autonomous lexicon allows such a dissociation, whereas a completely interactive model does not. (Emmorey and Fromkin 1988)

In fact, as some of the earlier-cited quotations indicate, there is nothing unquestionable about the distinction between linguistic and nonlinguistic meaning. To take the example given by Emmorey and Fromkin, it is perfectly possible to see knowing the chemical composition of water in terms merely of having fuller access to the meaning of the word *water*. Such knowledge allows one, for example, to accept as semantically non-anomalous sentences like 1 and 2 below in much the same way as one accepts 3 and 4 (whose acceptability would tend to be seen as linguistically based by semanticists of the Fromkin school):

1. Today we shall consider water and other hydrogen compounds.
2. Fish breathe water, just as we breathe air.
3. This is water, and here are some other liquids.
4. We drank some water.

(Compare:

1a. *Today we shall consider table-salt and other hydrogen compounds.

2a. *Fish milk water, just as we milk cows.

3a. *This is water, and here are some other solids.

4a. *We ate some water.)

Knowing about the relationship between water and hydrogen will also facilitate a derivational-morphological link between hydrogen and such words as *hydrophobia, hydroelectric, dehydrate,* etc., thus extending and strengthening a network of morpho-semantic connections between items which share a common reference-point in the word *water*. From another – not incompatible – point of view, it is entirely possible to regard the "everyday" or "basic" meaning of *water* as simply a distillation into unconscious automaticity of what one knows "pragmatically" from one's most frequent experiences with the substance to which the term most often relates.

Of course, one may be able to understand and appropriately use the term water in most contexts without knowing the chemical composition of its denotatum, but is this qualitatively different from being able to deal with a polysemous word in many contexts without knowing more than one of its meanings? To stay with the example of water, unless one knows that this item can in certain contexts be applied to brine, perfumed alcohol, and amniotic fluid, one will make little sense of the following:

5. Water, water, everywhere,
   Nor any drop to drink.

6. He reeked of Cologne water.

7. When her waters broke, she knew the time had come to make a 'phone call.

However, not having these meanings of *water* at one's disposal will not prevent one from getting by without difficulty or puzzlement in the majority of situations where the word crops up, provided that one has knows that it can refer to a naturally-occurring potable liquid.

To come to the last point in the above-quoted passage from Emmorey and Fromkin's 1988 article, it is simply not true that there is a necessary connection between positing a clear distinction between linguistic and "pragmatic" meaning and taking up a modularist position in respect of language in the mind. As we have seen, Chomsky

and Fodor favour the modularity model without committing themselves to such a distinction. Conversely, it would seem to me to be logically unproblematic to adhere to the view that one can distinguish linguistic meaning from nonlinguistic knowledge without accepting the postulate that the one is impermeable to the other during processing. After all, there is no contradiction between acknowledging that "such notions as morphemic level and syntactic level pick out coherent classes of representations" (Fodor 1983, p.92) and at the same time recognizing that information may flow between these levels during processing operations (cf. ibid., pp.76ff.)

Fodor's conception of lexical processing within the language module is, by contrast with Emmorey and Fromkin's, fundamentally nonsemantic. His treatment of the apparent role of contextual meaning in, for example, the processing triggered by reduced redundancy tasks, as we have seen, explains the relevant effects as either a consequence of nonstandard back-up procedures being brought into play under abnormal conditions or the result of the excitation – unaccompanied by semantic analysis – of networks of lexical nodes associated with forms occurring in the relevant contexts. The advantage, from Fodor's point of view, of his confining his conception of the language module to that of a non-semantic processor is that it does not confront him with the intractable problem, discussed above, of where to draw the line between linguistic and "pragmatic" meaning. However, on the one hand, his postulation of task-induced nonstandard processing is a two-edged sword, and, on the other, it is not clear that what he says about the excitation of lexical nodes succeeds in circumventing the semantic/pragmatic issue.

Concerning the nonstandard processing argument, obviously if it is legitimate for Fodor to invoke such an argument in relation to modularity-challenging results elicited by cloze procedures, it is legitimate for others to invoke it to account for modularity-friendly findings associated with other experimental procedures. Indeed, on the face of it, it seems odd that Fodor should wish to claim that the restoration of degraded linguistic stimuli – which is by no means unknown in the ordinary use of language – may trigger nonstandard processing, whereas he accepts as self-evidently indicative of normal processing the results of an experiment (Swinney 1979) that involved subjects in an extremely "highly attentional" exercise – consciously deciding whether or not visually presented strings of letters consti-

tuted words – while at the same time dealing with a series of unconnected sentences presented in a different mode – i.e. aurally. It is difficult not to see the task imposed by Swinney's procedure as far more artificial and form-focused than any cloze task, and thus far more likely than cloze to provoke nonstandard processing. I shall come back to this point.

With regard to the explanation of apparent "cognitive penetration" in terms of the excitation of complexes of lexical nodes, this seems plausible enough as a nonsemantic account of what looks like a semantically motivated phenomenon until one stops to consider the nature of the interconnections it presupposes. The evidence is that such interconnections do indeed exist, but that they are (in the proficient language user) primarily based on semantic relatedness, both paradigmatic and syntagmatic (see, e.g., Aitchison 1994). Indeed, if the nodal excitation posited by Fodor were not assumed to proceed along pathways linking semantically related items, then the "mimicking" of contextual-semantic effects of which he writes would remain unaccounted for. The nonsemantic process that Fodor posits as an explanation of evidence of context effects turns out, therefore, to be entirely dependent on connections between lexical nodes which derive from the denotative and connotative associations of the lexical items concerned. There is surely some inconsistency, to say the least of it, between Fodor's nonsemantic conception of the language module and his postulation of lexical activation via meaning-based pathways. Moreover, the meaning-based character of these pathways brings us right back to the question of the nature of meaning.

A third possible explanation of context effects which preserves Fodor's notion of informational encapsulation of intramodular processing is that the effects in question are genuinely contextually induced, but that they are "postperceptual" – that is, brought about by operations which (in language reception) come into play after the completion of intramodular processing and which take as their input the output of the module. This is the explanation offered by Carston, who cites an experiment of Swinney's (Onifer and Swinney 1981) which was conducted after the one referred to by Fodor:

> The second Swinney experiment was identical except the visual words were presented three syllables after the ambiguity; in this case ... only words related to the contextually relevant meaning of the ambiguity ... were facilitated. (Carston 1988, p.54)

Fodor's network account might explain this finding in terms of one of the two items activated by the ambiguity receiving more activation than the other – and consequently fading more slowly – because of an accumulation of occurrences in the relevant context of expressions which occasioned excitation of its node. Thus, in the sentence cited by Fodor in this connection – "Because he was afraid of electronic surveillance, the spy carefully searched the room for bugs" – the microphone node would be activated by *electronic surveillance* as well as by *bugs*. As Carston says, one prediction from this account would be that the letter-strings related to the contextually relevant sense of the ambiguity should be responded to more rapidly than those connected to the contextually irrelevant sense; and it transpires that this prediction is borne out by the reaction time statistics in Swinney's data.

Carston, however, offers an alternative interpretation of these findings:

> ... it could be that lexical forms map directly to a conceptual address in the central system where "encyclopedic" information about the denotation of the concept is stored and it is this knowledge which is responsible for the disambiguation rather than "dumb" network connections. (Carston 1988, p.55)

On this view, exhaustive module-internal lexical access would be followed by parallel mappings and context-related choices between accessed items:

> Both conceptual addresses are accessed briefly, which accounts for the Swinney effects, and all disambiguation is postperceptual – which is still of course quite compatible with the encapsulation of the language processor. (ibid.)

Carston claims that the direct conceptual mapping interpretation receives *prima facie* evidence from an experiment of Onifer's reported by Swinney (1982) which replicated the cross-modal lexical priming experiments with chronic schizophrenics who were known to resolve ambiguities solely on the basis of the frequencies of meaning involved. What emerged from Onifer's experiments was that both meanings of the ambiguous item were activated immediately, but that on the three-syllable delay test only the more frequent of the meanings was still active, whether or not it fitted the context. Carston's view is that Fodor's notion of network activation cannot explain these findings,

since it does not posit two separate mechanisms, whereas the model involving automatic mapping to conceptual addresses and subsequent attempts at contextual integration "is both compatible with all the results so far and can more reasonably be seen as involving two distinct processes, with the schizophrenic subjects unable to perform the latter one" (Carston 1988, p.57).

Let us not ignore, however, the possibility that what look like online context effects may actually *be* online context effects. Fodor himself points to the fact that Marslen-Wilson's (1973) subjects were not only able to repeat linguistic stimuli with a time lag of just a quarter of a second, they were also able to understand the words they were repeating. This means that not only formal aspects but also "cognitive" aspects of lexical processing must be extremely fast as far as the reception of speech is concerned. More recent experiments by Marslen-Wilson have shown that subjects take no longer to relate an incoming utterance to discoursal context – even where pragmatic inferencing is involved – than to process it "shallowly" (Marslen-Wilson and Tyler 1987).

Also relevant here is the way in which subjects involved in high-speed speech shadowing exhibit highly fluent restoration of mispronounced words, these fluent restorations occurring far more frequently during the shadowing of normal prose than when the mispronounced words were anomalous with respect to context (see, e.g., Marslen-Wilson 1975; Marslen Wilson and Welsh 1978). Other experimental findings from word-monitoring tasks (see Marslen-Wilson and Tyler 1980) have shown that in a normal spoken prose context target words which took on average 369 milliseconds to say could be identified on average within 200 milliseconds – which must mean that contextual information was somehow causing alternative possibilities to be eliminated while the words in question were still being uttered.

Another most interesting piece of evidence in favour of taking context effects at face value emerges from an experiment conducted by Foss (1982) in which he examined the influence of two aurally presented priming words on the identification of a target phoneme in a third aurally presented word. What Foss discovered was that there was substantial primimg across intervening words and sentences when coherent, meaningful sentences were used. For example, the recognition of /f/ in fish was primed in the following kind of con-

text: "The entire group examined the gills and fins. Everyone agreed that this was unlike any other fish caught in recent years." However, when the words were jumbled into random lists the priming effect disappeared. The fact that coherent contexts resulted in priming whereas lists of words did not surely constitutes counter-evidence to Fodor's notion that context effects are "mimicked" by the the activation of lexical networks in the mind merely through the occurrence of individual lexical forms. Carston's alternative view – that context effects are real but postperceptual – also receives little comfort from Foss's finding that initial phonemes of words (e.g. the /f/ in fish) were primed by previous context, and still less from Marslen-Wilson and Tyler's above-reported (1980) finding that context information took effect before the uttering of target words was complete. Such results cannot but be interpreted as strong evidence for the continuous online influence on receptive lexical processing of context-derived expectations – the same expectations that in ordinary interactions prompt a particular kind of interlocutor to finish our words for us!

How then to explain Swinney's cross-modal lexical primimg results? One possible explanation lies in their very cross-modality, and, in particular, in the fact that reading was involved. The general view among experimental psychologists seems to be that reading processes differ from listening processes in terms of the extent to which they use context. It is indeed a psychological commonplace that whereas in speech perception context effects are "readily obtainable", "in skilled reading ... context effects seem elusive" (Ellis and Beattie 1986, p.222). Thus, Fischler and Bloom's (1980) finding – the absence of facilitatory context effects from normal-speed reading –, which Fodor cites against the whole concept of "cognitive penetration", is normally interpreted as an indication of the particularity of the processing of the written signal with regard to use of context. Ellis and Beattie, for example, suggest that the ready decipherability of the printed word as opposed to the relatively impoverished nature of the speech signal favours "bottom-up" rather than "top-down" processing:

> If the language processing system has any option in whether or not it indulges in these complex computations [of using context to aid word recognition], then it may choose not to bother (or at least to bother less) when the signal is as readily decipherable as is the printed word. (Ellis and Beattie 1986, pp.225f.)

If it is true that printed stimuli give rise to a greater measure of "bottom-up" processing, then the fact that Swinney's experiments involved the use of visually presented letter-strings may well have triggered an across-the-board concentration by his subjects on the characteristics of individual lexical items – including the various senses of aurally presented ambiguous items – with the result that contextually irrelevant meanings as well as relevant meanings were activated. The same argument can be applied to other cross-modal studies whose findings have been cited as pro-modular (e.g., Seidenberg, Tanenhaus, Leiman and Bienkowski 1982; Tanenhaus and Donnenwerth-Nolan 1984; Tanenhaus, Leiman and Seidenberg 1979).[5]

None of the foregoing is to suggest that context effects are entirely absent from processing where printed stimuli are involved. One notes that even Swinney found that the contextually predictable meanings of his ambiguous items were more strongly activated than other meanings (see above). As far as tasks involving only reading are concerned, Fischler and Bloom (1980), while failing to find facilitatory context effects, did find that responses to words which were anomalous in context were inhibited relative to responses to contextually predictable words. This result too has been linked to the specifics of the reading process as opposed to the listening process. Harris and Coltheart (1986) note that in auditory word recognition we hear the sounds of any given word sequentially, which allows for the possibility of interaction between contextual information and recognition processes after only a part of the word has been uttered, but that, in contrast, in visual word recognition we have access to the whole word simultaneously, which abolishes any advantage in having a system which uses context to identify words before their production is complete.

> However, there is an advantage in having a system which can check word identification to see if the word which we have identified is consistent with context, and it is this checking procedure which Fischler and Bloom claim is causing the inhibition effects which they have demonstrated. (Harris and Coltheart 1986, p.170)

What Harris and Coltheart – and indeed Fischler and Bloom – claim, in other words, is that the use of context in normal reading is "postperceptual" because of the nature of the signal involved.

If lexical processing in reading really does differ from lexical processing in listening because of the ready decipherability and in-

stant availability of the signal in the former, it ought to be the case that rendering the written or printed stimulus more difficult to decipher will cause online context effects resembling those found in auditory word recognition to become discernible. And, indeed, this is what has been found. A number of experiments (see, e.g., Becker and Killion 1977; Stanovich and West 1983) have shown that where the signal information available to readers is degraded context effects are enhanced, and other experiments (see, e.g., Biemiller 1970; Perfetti, Goldman and Hogaboam 1979; Stanovich, West and Freeman 1981) have shown inexperienced and poor readers to be more dependent on context than skilled readers – presumably using contextual information to compensate for their "bottom-up" deficiencies.

This brings us back to Fodor's suggestion that context effects in cloze tasks may be the result of the operation some kind of abnormal back-up system. On the basis of the foregoing we can probably accept Fodor's claim, but in a completely contrary sense to the one he intended. It appears to be the case that degrading the written/printed signal causes the reader to activate word recognition processes which are normally reserved for the perception of speech. In other words, presenting readers with a degraded written/printed stimulus seems to rob the instruction-derived skill of reading of its specific signal-related characteristics in respect of lexical processing and to bring it closer to the "primary" skill of understanding speech.

8 The L2 dimension

We come now to the question of the relationship between the modularity hypothesis and the L2 mental lexicon. For some advocates of the modular view of language in the mind, its relevance to the L2 context is distinctly limited. Cook, for example, entertains the possibility that the conscious learning of an L2, which is typically (though not exclusively) associated with formal instructional settings, taps cognitive resources other than those of the language faculty:

> One possibility is that second languages can be learnt by other means than the language faculty. I learnt Latin by translating Virgil and memorizing ... grammatical explanations ... ; such teaching methods employ what Palmer (1926) called the "studial capacity", Krashen (1981) the Monitor, both of which are outside the language faculty. (Cook 1988, p.176)

Since L2 learning at least in Europe typically has a strong formal instructional component, the implication of the above is that a substantial proportion of the L2 competence at the disposal of most people living in this part of the world is extramodular and so does not actually qualify as competence in the Chomskyan sense of the term.

This kind of suggestion has been popularized over the last decade or so through the influence of Krashen's work – which Cook mentions. An exhaustive account of the Great Debate about Monitor Theory (see, e.g., Skehan 1984; McLaughlin 1987: chapter 2; Larsen-Freeman and Long 1991, pp.240ff.) would be out of place in the present discussion. However, one point that recurs in much of the criticism of Krashen's proposals, and which is highly relevant to what Cook has to say, is that consciousness is an extremely slippery concept. As Bialystok remarks – referring to Allport (1988) – with reference to a somewhat different matter,

> It is difficult to treat consciousness as a determining variable, primarily because the conditions of consciousness seem so elusive. (Bialystok 1990, p.122)

Nevertheless, the notion that formally learned L2s engage conscious processes to a greater extent than "naturalistically" acquired languages corresponds to the experience and intuitions of many an L2 learner and teacher, which presumably explains why Krashen's work has had such wide appeal.

Lexical processing appears to offer a particularly persuasive demonstration of this kind of difference. Whereas in our native language words seem to trip lightly off the tongue, when we are communicating in an L2 our output is frequently slow and halting because of lexical problems which necessitate conscious, often laborious, searches through memory and/or consciously formulated paraphrases. On the other hand, lexical difficulties and conscious lexical searches and strategies are certainly not unknown in L1 use; nor indeed should it be forgotten that as we gain in proficiency in even a formally learned L2, lexical problems and the consciousness thereof tend to diminish.

All the same, it has often been claimed (see, e.g., Gass and Selinker 1994; Laufer 1989; Meara 1984) that the L2 mental lexicon is fundamentally different in nature from the L1 mental lexicon. The received wisdom in certain quarters seems to be that the L2 mental lexicon is more formally based than the L1 lexicon. The evidence usually cited in support of this view is unpersuasive (see, e.g., Singleton forthcom-

ing, Chapter 4), and other evidence, including findings from the TCD Modern Languages Research Project (see, e.g., Singleton 1994; Singleton and Little 1991) run very much against such a position.

However, the question of where the L2 mental lexicon might stand in relation to some putative language module remains unanswered. As we have seen, even those who are persuaded of the existence of a language module are divided and/or agnostic about the relationship between the lexical area generally and such a module. Moreover, if Fodor is prepared to accept (as he is) that what look like the same operations can be carried out either intramodularly or by an extramodular back-up system, and Cook and others (e.g. Bley-Vroman 1989) are prepared to suggest (as they are) that at least some aspects of L2 learning and processing at least in some circumstances are performed by just such a back-up system, what kind of empirical evidence could ever demonstrate in the face of such subtlety that the L1 and the L2 lexicon belong to the same rather than parallel universes?

Singleton (1993) explores this empirical problematic a little further by looking at some of the TCD Modern Languages Research Project data in the light of the modularity hypothesis. The particular data used were elicited by two pairs of written reduced-redundancy tests (C-tests[6]) administered on two separate testing occasions to the same group of ten advanced (university-level) learners of French as a foreign language. The solutions offered by subjects in their responses to these tests show clear context effects. As Singleton points out, however, such effects do not trouble the modularity hypothesis in the least degree. They could be explained as the results of the operation of an extramodular back-up system. After all, it is precisely in respect of data elicited by reduced-redundancy procedures that Fodor makes the back-up system argument. It is true that there is a counter-argument to the notion that the reduced redundancy of the C-test triggers "unnatural" processing – in the shape of the above-cited evidence that where a written/printed signal is degraded this appears to induce processes that are closer to speech processing operations than where an intact written/printed signal is involved. There remains, though, Fodor's suggestion that context effects may be "mimicked" through the excitation by occurring lexical forms of related lexical nodes in the mind, and objections to this suggestion based on previous experimental findings could easily enough be met with the unanswerable riposte that in a written test there is in any case ample

time for all contextual influence to be "postperceptual". Moreover, since the language involved is a foreign language which all subjects learned to a large extent in formal instructional settings, it could also be argued, following Cook, that the processing was being carried out in full or in part by an extramodular (and hence unencapsulated) conscious Monitor of some kind.

There is, as it happens, no evidence in Singleton's (1993) data of a particular association between context effects and conscious decision-making (as signalled by subjects' introspective comments); indications of conscious decision-making tend to crop up more often, if anything, in relation to "non-contextual", "bottom-up"-type responses. Nor does Singleton find anything in his data to suggest that the products of conscious processing are different in kind from those of unconscious processing. Thus, in many instances where an identical solution has been offered a number of times in response to a given "slot", it transpires that some of the responses in question have been commented on (and thus, presumably, produced with some degree of deliberation) while others have not. These findings, which may say something about the differentiating effect (or lack of effect) of conscious strategizing in the process of arriving at C-test solutions do not – any more than the evidence of context-effects discussed previously – constitute evidence against the modularity hypothesis. Proponents of this hypothesis could readily explain them away in terms of the entirety of instructed L2 processing happening outside the language module (where encapsulation is not an issue and consciousness may not signify), and/or in terms of the confounding intervention of unconscious but "postperceptual" central processes. Such results might perhaps forestall a simplistic or extravagant interpretation of modularist claims in relation to L2 processing, but what they and their discussion principally demonstrate is the high degree of immunity conferred on the modularity hypothesis by the terms in which it is defined to various kinds of empirical scrutiny in an L2 perspective.

9 Summary

This paper has presented in general terms the concept of a language module and sketched a difference in approach between Chomsky's preoccupations in relation to the modularity issue and

those of Fodor. It has examined the neurolinguistic arguments in favour of modularity and found them wanting. Fodor's claims in relation to the language module having been summarized, the notion of informational encapsulation, which lies at the heart of Fodor's conception of modularity, has been scrutinized in the light of evidence pro and contra, the latter being found the more persuasive. The implications of the modularity hypothesis for the mental lexicon have been explored in relation to differing views of lexical meaning, and an alternative interpretation has been offered of experimental evidence appearing to support a modular perspective on lexical processing. Finally, it has been argued that, in an L2 perspective, the terms of the modularity hypothesis render it immune to various kinds of apparent counter-evidence arising from L2 lexical research.

Notes

1. "Innate fixed nucleus" – i.e., the innate "language acquisition device" or language faculty.
2. "**shadowing** – A psycholinguistic technique in which hearers speak out loud language which is being played into their ears through earphones." (Aitchison 1992, p.79).
3. "It was then noted that in the spot where the coin had been placed there was a phlyctenoidal erythema indicative of a first-degree burn."
4. "In the cloze procedure words are deleted from a text after allowing a few sentences of introduction. The deletion rate is mechanically set, usually between every 5th and 11th word. Candidates have to fill each gap by supplying the word they think has been deleted." (Weir 1988, p.49)
5. Experimental evidence cited against an online role for contextual information in lexical processing from studies other than those with a cross-modal design tends to be ambiguous. Even modularists accept that such evidence is amenable to nonmodular as well as modular interpretations (see, e.g., Tanenhaus, Dell and Carlson 1987, pp.100f.).
6. "An adaptation of the cloze technique ... based on the same theoretical rationale as cloze ... In the C-test every second word in a

text is partially deleted. ... students are given the first half of the deleted word. The examinee completes the word ..." (Weir 1988, pp.52f.).

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